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REVIEW OF THE STATUS OF EXPLOITATION OF THE WORLD FISH RESOURCES

Prepared by

Department of Fisheries

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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PREPARATION OF THIS DOCUMENT

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I INTRODUCTION

1 At the Eighth Session of the Committee on Fisheries, the Secretariat presented a document (COFI/73/Inf.5) providing a summary review of the status of stocks in each major sea area. It was felt that this material, though originally compiled in 1973 at the request of the Sea-Bed Committee in preparation for the UN Conference on the Law of the Sea, was also valuable for the work of the Committee on Fisheries. In its report (paragraphs 36-37)[1/], the Committee expressed the view that such a document, which should be based on the results of FAO's World Appraisal of Fishery Resources, updated and with the most recent statistics, should be presented each year.

2 The present paper is the first of such annual reviews. Apart from including the most recent data, the statistical presentation has been brought into a more standard format, though further versions may be needed to find the most acceptable form. The commentary for each region is again concerned with general statements about the status of the resource but it is expected in future versions to put more emphasis on the changes and developments during the current year. Other changes are that consideration is given to all stocks, and not only those that are, or might be, heavily exploited. Also, a short section on inland fishery resources is included. It is hoped to give further attention to these important resources in later reviews.

3 For each region a table has been prepared, summarizing, for each major stock the main countries exploiting that stock, the potential yield from its current catches, management measures (if any) and their effect. In assessing the state of exploitation four broad classifications have been used:

Lightly exploited:	where current catches are an insignificant fraction of the potential
Moderately exploited:	where current catches are a significant fraction of the potential, but where appreciable increases in sustained catch can still be obtained by increased fishing
Fully exploited:	where current catches approach the potential of the resource, and increased fishing would not give appreciable increases in sustained catch. Some increase in catch would probably be achieved by suitable management measures, such as protection of the small fish, or adjustment of the fishing mortality. However, stocks of fish placed in this group, which includes many of the world's major fisheries, have not been depleted to the state where their productivity and the possible sustained annual catch have been seriously reduced
Depleted:	stocks that have been so reduced that the current catches from them are much less than the possible sustained catch

4 These definitions have been made purely in terms of the magnitude of the gross catch from the resource, relative to the potential sustained catch. Clearly, management measures are desirable in any heavily fished stock where some increase in catch could be achieved by such measures, and urgently required in any depleted stock. In addition suitable measures may be highly desirable in any heavily fished stock in which the amount of fishing is, as it often is, greatly in excess of that needed to take the current harvest. Considerable benefits could be obtained by diverting the excess to more productive operations, e.g. fishing some less heavily exploited resource. The possible existence of such economic waste needs to be borne in mind when assessing the performance of any management regime.

1/ FAO Fisheries Reports, No. 135

Table 1

Northeast Atlantic

Stocks	Principal countries	Catches ('000 tons)						Status of exploitation	Management measures in effect (on recommendations of Northeast Atlantic Fishery Commission, unless otherwise stated)
		Estimated potential	Average 1951-55	Average 1961-65	1970	1971	1972		
Cod									
Northeast Arctic	Norway, USSR, UK	1 000 (c)	888	693	944	724	642	Fully exploited	Minimum mesh size giving some benefit. Tripartite agreement on catch limitation
Iceland	Iceland, Germany (Fed.Rep.of), UK	525	463	397	471	453	400	Fully exploited	Minimum mesh size giving some benefit
North Sea	Belgium, Denmark, Germany (Fed.Rep. of), France, Netherlands, UK	150	78	121	225	320	323	Fully exploited	Minimum mesh size in force but too small to have very significant effect. Current high catches due to exceptionally good year-classes
Haddock									
Northeast Arctic	Norway, UK, USSR	100-150	89	125	84	80	187	Fully exploited	Minimum mesh size giving some benefits
North Sea	Denmark, France, Germany (Fed.Rep. of), Netherlands, UK, USSR	150	65	120	670	258	213	Fully exploited	Minimum mesh size and landing size have given benefits, possibly considerable. Recent very high catches are due to exceptionally good year-classes, possibly in part the indirect result of the mesh regulations
Hake	Spain, France, Portugal	150	121	129	117	62	109	Fully exploited, and depleted in northern part of its range	
Saithe	Norway, USSR, France, Iceland, Germany (Fed.Rep. of)	(700)	224	290	615	653	625	Fully exploited	Minimum mesh size in force giving some small benefit
Blue Whiting	No significant fishery	(1 000) (a)	No data	No data	32	74	34	Virtually unexploited	
Sandeels	Denmark	500	No data	123	192	395	366	Moderate	Controls on incidental catches of larger species
Capelin									
Northeast Arctic	Norway, USSR	(d)	-	99	1 314	1 392	1 593	Fully exploited	National regulation of fishery for spawning capelin
Iceland	Iceland	(300)	-	12	191	183	277	Moderately to fully exploited	
Herring									
Atlanto-Scandian	Norway, USSR, Iceland	1 500	907 (b)	801	62	22	13	Depleted	Catch quota on fat herring in Norwegian fishery for juveniles
North Sea	Norway, Denmark, Sweden, Germany (Fed.rep.of), Netherlands, UK	1 000	982 (b)	867	749	644	616	Fully exploited or depleted	Catches controlled by system of closed areas and closed seasons. More direct limits on catches being considered
Pilchard	Portugal, Spain, France	400 (c)	161	242	140	161	182	Moderately to fully exploited	
Mackerel									
North Sea	Norway, Denmark	400	45	88	290	228	163	Fully exploited	Norwegian fishery regulated by unilateral controls on the open season
Squid	France, Spain, UK	1 000	No data	No data	5	14	11	Virtually unexploited except locally	
TOTAL:			8 137	7 685	10 670	10 430	10 710		

(a) Estimate in "Fish Resources of the Ocean" - probably too low

(b) Average for 1956-60

(c) May be too high

(d) No estimate available

5 For each major resource in each region a figure is given which is the best available estimate of the potential catch from that resource. These have largely been drawn from the existing FAO study "The Fish Resources of the Ocean"[2/]. It is now several years since this study was prepared and new evidence, particularly in the recent development of fisheries, has caused many of the estimates to be revised. A particularly productive source of revision has been the working parties of the various regional bodies (Fishery Committee for the Eastern Central Atlantic [CECAF], Regional Fisheries Advisory Commission for the Southeast Atlantic [CARPAS], and others). Comprehensive revisions of the potential in each region are now being prepared and, where improved figures are available, these have been included. This improvement accounts for the instances where the figures for potential given here are different from those in the report presented last year.

6 The report presented last year provided a general review of each area, without special attention being given to events of the past year. The present paper concentrates more on changes that have taken place since the original document was produced but, in order to make it self-contained and readily comprehensible without reference to other material, a general review (often unchanged from the original report) is also given. In the following sections the trends in the fisheries in each region are described separately. In general they show that the trend of increasing catches has continued in most areas. Particularly striking increases have occurred in some areas, e.g. eastern central Atlantic, and parts of the north Pacific, which were known to be relatively lightly exploited five years ago. In contrast, in those regions (north Atlantic, southeast Pacific) which had been noted for some time as being relatively heavily exploited, catches have increased little. A striking feature of 1972 and 1973 has been the low catches of anchovy from Peru (discussed in more detail below). The drop in anchovy catches from 11.2 million tons in 1971 to 4.8 million tons in 1972, caused a drop in world catch to 65.6 million tons, though the main catch less anchovy, has continued to increase.

II NORTHEAST ATLANTIC

7 This area (with the north Pacific) is one of the cradles of modern fishery development. It is therefore an area where the problems of high intensities of fishing have been in existence for a long time, and where the machinery for the international scientific study (through the International Council for the Exploration of the Sea [ICES]) and the implementation of international agreements on regulatory measures (through various arrangements in the past and now through the North-East Atlantic Fisheries Commission [NEAFC]) are well established. NEAFC's area of competence does not include the Baltic, and a Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts, which will bring into existence an International Baltic Sea Fishery Commission, was signed in September 1973 but is not yet in force.

8 A feature of the fisheries in this area is that in general they have developed slowly, and that the fleets and the capital and other resources behind them are effectively very mobile. Thus as stocks in one area, e.g. in the North Sea, became fully exploited, attention could be diverted to other areas, e.g. the Barents Sea, before serious damage was done to the stocks or the fisheries in the former area. This is particularly true of the fisheries for demersal fish but most of these stocks are now fully exploited and no significant increase in sustained catches could be obtained by fishing harder; however, the stocks have not, in general, been depleted to the extent that their productivity has been reduced. Some increase in catch might be obtained by careful management, adjusting both the rate of fishing and the sizes caught. Saithe (coalfish) until recently were not fully exploited, and catches have been increasing. They now appear to have reached the level of full utilization, and in fact the catches in 1972 were, for the first time since 1966, less than in the previous year. Some stocks of species of low market value, or difficult to harvest economically, still remain unexploited—for example, blue whiting. Considerable interest is being shown in this species, of which the potential is believed to be large.

2/ Published by Fishing News (Books) Ltd., England, 1971

Table 2

Northwest Atlantic

Stocks	Principal countries	Catches ('000 tons)							Status of exploitation	Management measures
		Estimated potential	1952	1960	1965	1970	1971	1972		
Cod										
West Greenland	Denmark, Germany (Fed.Rep.of), Portugal, Spain, UK	350-450 (d)	294	243	359	111	121	111	Fully exploited	
Labrador	Canada, Germany (Fed.Rep.of), Poland, Portugal, Spain, USSR	300-400	61	188	333	217	163	163)		Mesh regulations in force for some years in most cod and haddock fisheries. Catch quotas set for all major stocks
Newfoundland	Canada, France, Germany (Fed. Rep.of), Norway, Poland, Portugal, Spain	450-600	328	471	498	528	514	524)	Fully exploited	
Nova Scotia	Canada, France, Portugal, Spain	250-300	132	218	225	262	222	209)		
Haddock										
Georges Bank	Canada, Spain, USA, USSR	50-70	51	46	155	13	12	7)	Depleted	
Nova Scotia	Canada, Spain, USA, USSR	50-60	55	44 (c)	83	28	31	18)		
Silver Hake										
Georges Bank	USA, USSR	300-400 (f)	41 (a)	47 (c)	323	49	97	107)	Fully exploited	
Nova Scotia	USSR	50-150	-	-	50	169	129	114)		
Redfish										
All divisions	Canada, Germany (Fed.Rep.of), Poland, USA, USSR	250	102	288	231	224	274	286	Fully exploited	
Capelin	Canada, USSR	Several hundred	No data	No data	7	7	6	73	Exploitation just beginning	
Herring										
Gulf of St.Laurence	Canada, Germany	300-1 000	152	24 (c)	57	321	272	128)	Fully exploited	
Banquereau-Nova Scotia	(Fed.Rep.of), Poland, USA, USSR			32 (c)	84	228	153	180)		
Gulf of Maine				123 (c)	134	220	276	221)		
Georges Bank										
Mackerel	-	Uncertain	11	24	16	228	373	398	Becoming fully exploited	
Sandeels	-	Several hundred	-	-	-	-	0	1	Unexploited	
Squid	Canada, Japan	Several hundred	(b)	(b)	(b)	3	31	51	Exploitation just beginning	
TOTAL:			1 330 (e)	2 279 (e)	3 300	4 240	4 350	4 330		

(a) Catches in 1954

(b) No separate data published by ICNAF until 1970. Small catches taken by local Canadian fishermen, principally for bait. Very recently Japanese trawlers have started fishing for squid on an experimental scale

(c) Catches in 1961

(d) Potential from recent year-classes much less

(e) Excludes catches from ICNAF sub-area 6

(f) May be too high

9 Most of the short-term variation in catches can be ascribed to variations in year-class strength. In particular the very high catches of haddock in the North Sea in 1970 were due to the outstanding 1967 year-class. A succession of good year-classes has also increased the yield of cod from the North Sea. The cause of these good year-classes is not known. An outstanding year-class in one particular year is presumably due to unusually favourable environmental factors in that year, but the abundance of adults may be important. For some North Sea demersal fish this has recently been high. On the other hand, for the cod stocks in the northeast Arctic there is evidence that poor year-classes between 1965 and 1969 were at least partly due to low parent stocks. These poor year-classes are causing catches to decline from a peak in 1970.

10 Some pelagic stocks have been more severely reduced. The large Atlanto-Scandian stock of herring has been reduced to a very low level. No good year-classes have appeared since the outstanding ones of 1959 and 1960, which were largely removed by heaving fishing between 1964 and 1967. Though a run of poor year-classes is not unusual in this stock, the currently very low stock abundance may fail to produce a good recruitment even when conditions are favourable. The smaller Downs stock of herring in the southern North Sea has also been reduced to a low level but is showing signs of a slight recovery. The other herring stocks in the North Sea are not yet at such low levels but, unless restrictions can be applied on the total catch, they may be reduced to a critical level.

11 Heavy fishing around 1967 had reduced the North Sea mackerel stocks, but restrictions applied by Norway (the country principally concerned) prevented the decline continuing to a very low level. A strong year-class was born in 1969 and this is now leading to a re-building of the stock. Restrictions were applied to the Norwegian fishery for capelin—to which the purse seine fleet turned when the mackerel catches declined—at a relatively earlier stage, i.e. before the stock had been seriously reduced. It appears that the capelin production is being maintained at a high level.

III NORTHWEST ATLANTIC

12 This region has been for centuries an important area for long-distance fishing fleets, which in fact preceded the development of any significant local fisheries. The European fleets originally fished for salt and dried cod, and in the last few years for a wide variety of species. Since 1951 international research and management action has been the responsibility of the International Commission for the Northwest Atlantic Fisheries (ICNAF).

13 The expansion of fishing by an increasing number and sizes of long-range fleets has resulted in a steadily increasing number of stocks becoming heavily exploited. Most stocks of cod, haddock and redfish were fully exploited ten years ago. In succession other major stocks, such as silver hake and herring, have become fully exploited. Most recently catches of mackerel expanded rapidly to 373 000 t in 1971. The 1972 catch was about the same, suggesting that the potential of this resource has been approached or even passed. Large-scale fisheries on squid and capelin are just developing, and these are probably capable of significant further expansion.

14 Catches from several stocks, most notably silver hake, have varied very much from year to year, due to fluctuation in recruitment. Most of these fluctuations appear to be independent of fishing, and of the abundance of adults. In the Georges Bank haddock stock there has been no good year-class since that of 1963, and the more recent of these poor year-classes are associated with low levels of parent stock. The abundance of this stock, and of other haddock stocks in the ICNAF area is now at a very low level.

15 The first management measures introduced by ICNAF were for controls on the size of mesh in trawls, and minimum mesh controls are now in force in all parts of the region for the trawl fisheries for cod, haddock, and other demersal species. Following the serious decline in the Georges Bank haddock stocks, catch limitations (without allocation to country) were introduced for this stock. These quotas have been progressively reduced, and directed fishing for haddock in 1974 has now been prohibited. In addition, areas where haddock are normally concentrated have been closed to demersal fishing during the spawning season.

Table 3

Mediterranean and Black Seas

Stocks	Principal countries	Catches ('000 tons)				Status of exploitation	Management measures
		Estimated potential	1970	1971	1972		
Mediterranean							
Pelagic fish	France, Greece, Italy, Spain, etc.	Unknown (1 000?) (a)	320	(b)	(b)	Mostly moderately exploited	Numerous local regulations not always fully effective - 40 mm mesh size recommended by GFCM for trawl fisheries in the Mediterranean
Demersal fish		500	250	(b)	(b)	Mostly fully or over exploited along the European coasts, moderate expansion possible locally elsewhere	
Crustacean		50	25	(b)	(b)		
Black Sea							
Demersal and Pelagic fish	Turkey, USSR	> 500 (a)	470			Moderately exploited	
TOTAL:			1 070	1 050	1 090		

(a) Very rough estimate, no precise assessments available

(b) No separate data available

Table 4

Northwest Pacific

Stocks	Principal countries	Catches ('000 tons) [see Note (a)]					Status of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
Salmon	Japan, USSR	(b)	240	160	220	155	Somewhat depleted	Catch quotas
Alaska pollock	Japan, USSR	(c)	826	1 959	2 645	2 782	Probably close to full exploitation	
Other demersal	China, Japan, Rep.of Korea, USSR	4000-5000	1 181	1 333	1 421	1 245	Most stocks fully exploited	Bilateral agreements to limit fishing effort in some areas
Herring	Japan, USSR		939	964	1 022	961	Many stocks fully exploited	Licence limitation in Japanese fisheries: some bilateral agreements
Anchovy	Japan, Rep.of Korea		473	430	428	475		
Saury	Japan, Rep.of Korea, USSR		306	163	264	282		
Jack Mackerel	Japan		553	222	283	156		
Chub Mackerel	Japan, Rep.of Korea		694	1 302	1 253	1 188		
Total pelagic (including species above)		5000-6000	3 142	3 474	3 661	3 521		
Squid	Japan, Rep.of Korea		600	627	572	667		
Total (excluding China and North Korea)			7 700	8 750	10 650	10 900		
Estimated Total: all countries			10 700	13 000	14 300	14 600		

(a) Detailed statistics regarding the catches of China and North Korea are not available. Catches by these countries are not included in this Table except in the final figures of total estimated catch

(b) Maximum yield under fully effective management would amount to considerably more than the present catches

(c) No explicit estimate made. Potential is probably close to current catches

16 Concern that other stocks, particularly herring, might suffer a similar decline, combined with strong pressure from the fishermen of the coastal states, has led ICNAF to adopt strong conservation measures. In a series of five regular, mid-term and special Commission meetings between January 1972 and January 1974 a succession of measures was introduced setting catch quotas for a wide range of stocks, with allocation to countries. These quotas now cover all the significant fisheries in the northwest Atlantic and include controls on developing fisheries such as those on capelin and squid. In addition, in the southern areas additional controls are being set on the total catch of all species. This two-tier system is designed to reduce the problems of incidental catches of one species taken while fishing for another, and of switching attention between different species. Most of these controls are due to come into operation in 1973 or 1974, hence their effect on the stocks is not yet apparent.

17 The steps taken by ICNAF in the last two years, including the two-tier system and the setting of precautionary quotas on stocks before they become too heavily exploited, represent the most progressive and sophisticated approach to international fisheries management so far achieved. Much still remains to be done. It is not yet known how closely these complex measures can be enforced, and the extent to which national or international measures of inspection or control can ensure general confidence that the regulations are being complied. These and other problems are now being faced by ICNAF.

IV MEDITERRANEAN AND BLACK SEAS

18 The Mediterranean is not basically a very productive sea, and the potential yield in weight from it is considerably less than that from many other areas; however, the great demand for fish has resulted in very high prices, and the total value of the Mediterranean catch is as large as that of the catch from several more productive regions. The Black Sea, including the Sea of Azov, is generally more productive in respect to pelagic species.

19 This high demand has caused a high intensity of fishing and most of the demersal stocks off the European coasts are approximately fully exploited, though some local stocks could provide greater catches from increased fishing. These lightly or moderately exploited stocks include anchovy, sprat and horse-mackerel in the Black Sea, demersal fish off the African coasts, deep-water shrimp, and most pelagic stocks (e.g. sardine, anchovy, sardinella) in the Mediterranean for which the demand is not so high.

20 Generally though, the opportunities for increased catches and reduced costs of fishing come through the application of more rational management. For example, the use of larger meshes in trawls would appreciably increase the yield of several valuable demersal species. In addition, existing national regulations are not always effectively enforced. Unfortunately, owing in part to the scattered nature of most of the fisheries and the consequent lack of good statistical data, the detailed scientific assessments on which better management can be based have been lacking. At its Twelfth Session in March 1974, the General Fisheries Council for the Mediterranean (GFCM) recommended that mesh size regulations existing in the legislation of countries bordering the Mediterranean and the Black Seas be harmonized and more effectively enforced. As a first step, it also recommended that mesh size smaller than 40 mm be prohibited in trawl fisheries of the Mediterranean.

V NORTHWEST PACIFIC

21 This region, particularly the coastal waters of Japan and China, have always supported important fisheries. A recent development has been the extension of intense fishing northwards, principally by the large long-range fleets of Japan and the U.S.S.R., and more recently the Republic of Korea. A detailed assessment of the state of the stocks in the region is made difficult by the limited availability of statistical data. For some important countries, e.g. China, even the total catch is not well known, and for others the details on the species caught, or the areas fished, are incomplete.

Table 5

Northeast Pacific

Stocks	Principal countries	Catches ('000 tons)						Status of exploitation	Management measures
		Estimated potential	1961	1965	1970	1971	1972		
Alaska pollock	Japan, USSR	Unknown	24	216	1 098	944	1 431	Probably approaching full exploitation	
Pacific hake	USA, USSR	210	-	1	171	183	120	Probably moderately exploited	Some bilateral arrangements
Pacific Ocean perch	Canada, Japan, USA, USSR	210	No data	455	121	125	131	Fully exploited	
Halibut	Canada, Japan, USA, USSR	38	50 (b)	39 (b)	34 (b)	30 (b)	27 (b)	Fully exploited	Canadian and US catches controlled by IPHC
Other flatfishes	Canada, Japan, USA, USSR	500 (d)	450	86	225	263	204	Mostly fully exploited	
Salmons	Canada, USA	250	-	188	256	202	175	Fully exploited; some local stocks possibly depleted	Fishing controlled by local Canadian and US regulations and by INPFC and IPSFC
Herring: British Columbia	Canada	200	203	201	4	10	39	Depleted, now recovering	Fishing controlled by Canadian regulations and by INPFC
Other stocks	Japan, USA, USSR	1 900	100	28	152	58	74	Generally lightly or unexploited	
Capelin and other pelagic fish	-		-	-	-	-	-		
King crab	Japan, USA, USSR	100 (a)	88 (a)	62	36	38	35	Fully exploited	Catches controlled by a number of national regulations and bilateral agreements
Shrimp	USA	Unknown	Small	18	41	47	47	Approaching full exploitation in some areas	
TOTAL: All species			(c)	1 460	2 650	2 320	2 740		

(a) Includes Northwest Pacific

(b) Excluding catches by USSR

(c) No separate data

(d) May be too high

22 The only stock for which there is reasonable evidence that man's activities have caused depletion is the salmon, for which the combination of heavy fishing and deterioration of the spawning grounds has caused catches to decline to levels substantially less than could be sustained with optimum management. Action is currently being taken, under a Japan-Soviet agreement, to limit the total catch but this does not seem to be enough to rebuild the stocks.

23 The other very important species in the northern part of the region is the Alaska pollack. Total catches in the whole north Pacific have been steadily increasing. In the waters close to Japan the stocks of pollack are fully exploited and catches have levelled off. Elsewhere catches have still been expanded but it appears that the limit of these resources is being approached.

24 In the waters round Japan there have been during the past century great changes in the composition of the pelagic catches. Some species, e.g. Japanese sardine and herring, which in the past had provided great catches, have almost disappeared while others, e.g. mackerel, have increased greatly. These changes are probably due to a combination of variations in the oceanographic regime and the effects of fishing. While some individual species have been, for one reason or another, depleted, the Japanese catch of pelagic species has remained fairly constant (around 2-2.5 million t) during the last two decades. The most recent significant changes in these stocks have been a sudden recovery in the saury stock, a decline in jack-mackerel, and a suggestion that the period of expansion in the mackerel may have ended. Taken as a whole, the pelagic stocks are probably fully exploited, with catches fluctuating around a level of 1-2.5 million t.

25 In the more southern waters, including the Yellow Sea, east China Sea, and the north-eastern part of the south China Sea, the non-availability of good statistics from some of the countries concerned makes an evaluation of the status of the resources difficult. Probably many of the stocks are now fairly heavily exploited.

26 The demersal fisheries in the region generally appear to be fairly fully exploited but, again, the lack of good statistics in the southern area makes precise assessment difficult. Management of the Japanese coastal fisheries has been chiefly directed to allocating resources among different fisheries, particularly through licensing schemes, and to ensuring the social and economic well-being of the local fishing communities. These have also kept catches at high levels. In the Yellow Sea and east China Sea, the stocks are exploited by a number of countries, and for political reasons there is no comprehensive agreement on management of the resources; however, there are some bilateral agreements at governmental or non-governmental level on such matters as the limitation of the number of vessels operating in certain areas at certain seasons, mesh sizes in trawls, etc. It is likely that some increase in sustained catch could be obtained from further management measures, especially those based on better scientific and statistical data.

VI NORTHEAST PACIFIC

27 The fisheries in this region provide a contrast between the long-established and relatively stable fisheries (principally for high valued species such as salmon and halibut) carried out by North American fishermen, and the newer fisheries by Asian countries. The latter have switched from species to species in what is a classic example of pulse fishing. These changes make it difficult to assess the status.

28 The most interesting recent development in the management of the salmon fisheries is the steps being taken by Canada to establish a licencing system to make a better economic use of the resource. Under this scheme a large number of the less productive vessels have already been withdrawn from the fishery. In the other fishery with a long history of management, that for halibut, the effectiveness of the controls on the directed fishery with long-lines appears to have been reduced by the appreciable incidental catches of small halibut in the large trawl fisheries for other species. Though the magnitude of these catches is not precisely known, there may have been a significant decline in the total halibut catch.

Table 6

Western Central Atlantic

Stocks	Principal countries	Catches ('000 tons)					Status of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
Menhaden								
U.S.Atlantic coast (b)	USA	300	319	298	265	378	Fully exploited	Peak catches nearly 800 000 tons - National system of closed areas and seasons
U.S.Gulf coast	USA	500	463	549	729	502	Fully exploited	National system of closed areas and seasons
Other Pelagic Fish								
U.S.Coasts	-	1 000	-	-	-	-	Virtually unexploited	
Demersal Fish								
U.S.Gulf coast	USA	1 000	(a)	(a)	(a)	(a)	Moderately fished	
Pelagic Fish								
Caribbean	Venezuela	(400-800)	-	70	79	82	Mostly lightly exploited	
Shrimp								
Gulf of Mexico	Cuba, Mexico, USA	150	140	140	140	143	Fully exploited	Closed areas and seasons set by individual states in US
Northeast coast of S.America	Brazil, Guyana, Japan, USA	40	(c)	30	36	36	Fully exploited	
TOTAL:			1 401	1 440	1 580	1 510		

(a) Large quantities, possibly up to half a million tons are taken incidentally in the shrimp fisheries, but only relatively small quantities, a few tens of thousands of tons, are landed

(b) Includes catches taken from the same stock in the Northwest Atlantic

(c) Data not available

29 The trawl fisheries for other species are much larger than the halibut fishery. Recently the most striking feature has been the development of the fishery for Alaska pollack. Taking the north Pacific as a whole, this is now the world's largest single species demersal fishery. Though catches in 1972 in the northeast Pacific were 40% above the previous highest catch, concern is being expressed that the limit of the potential is being approached. Catches of some other species (e.g. ocean perch and some flatfish) seem to be stabilizing after a marked decline from the high peaks of the initial pulse of fishing. It may be noted that these latter species are long-lived and may give an initial yield from an accumulated stock that is much higher than the sustained annual yield. Pollack is shorter lived, with a relatively smaller accumulated stock, so that there is less likelihood that current catches are substantially in excess of the level that can be sustained. In the eastern Bering Sea, some regulations on total catch, fishing area and fishing season are in force.

30 A significant event in this region has been the recovery of the British Columbia herring stock. This had been reduced to a very low level, and in the 1967-68 season the Canadian Government introduced strict controls. These seem to have permitted the stock to rebuild to a level where some catching can be allowed.

VII WESTERN CENTRAL ATLANTIC

31 Although a large number of species are caught in this region in a great variety of fisheries, two fisheries dominate the area—the U.S. menhaden fishery in terms of volume, and the shrimp fisheries in terms of value. Stocks of menhaden and of the main species of penaeid shrimp are fully exploited, but there are other substantial stocks of both pelagic and demersal species that are at most only lightly exploited. Management problems are therefore virtually confined to the shrimp and menhaden fisheries, and for the other stocks the need is to expand the amount of fishing.

32 Two species of menhaden are concerned—one along the U.S. Atlantic coast and the other in the Gulf of Mexico—both exploited solely by the United States. The Atlantic stock (partly caught in the northwest Atlantic area) used to support the main part of the fishery, catches reaching a peak of nearly 800 000 t in 1956. Thereafter the stock showed signs of falling productivity, alarmingly similar to those of the Californian sardine, and catches fell to only 178 000 t in 1969; however, since then the catches have been increasing again. Heavy exploitation of the Gulf menhaden is more recent and catches reached a peak of 729 000 t in 1971, but fell in 1972 after a period of fairly steady expansion.

33 Most of the shrimp stocks in this region are exploited only by the country adjacent to the resource, but some stocks are fished by several countries, e.g. those off Campeche Bank (fished by the U.S.A., Mexico and Cuba) and those off the northwestern coast of the South American continent. There are a large number of independent stocks of shrimp in the region but the state of the stocks of the preferred species is much the same. These species are all already, or are becoming, heavily exploited but, due to the biological characteristics of the shrimp, not to the extent that the productivity of the stocks or the total yield has been significantly affected. For some stocks concern has been expressed over the effect of alternative uses of coastal waters (land reclamation, waste disposal, etc.) on their nursery areas.

34 A number of national or (in the case of the U.S.A.) state legislations on such matters as closed areas or seasons, and sizes that may be landed, are in force, though their effect on the shrimp stocks or the catches from them have not been clearly established. There are few direct national or regional controls on the amount of fishing, though it is likely that the total capacity of the shrimp fleets in the area will soon exceed by a significant degree that required to exploit fully the shrimp stocks (if indeed they have not already done so), and thus may well lead to economic difficulties.

VIII EASTERN CENTRAL ATLANTIC

35 This region can be divided into three regions, based on the natural environmental conditions—the off-shore oceanic region, the northern sub-tropical coastal region and the

Table 7

CECAF area: State of exploitation and potentials of the main fish stocks

Zones	Stocks	Principal countries	Catches ('000 tons)					Status of exploitation	Management measures
			Estimated potential	1965	1970	1971	1972		
Oceanic	Yellowfin	France, Japan, Senegal, Spain, USA, etc.	(90) (a)	67 (a)	77 (a)	72 (a)	97 (a)	Fully exploited	Minimum sizes adopted by ICCAT
	Bigeye tuna		Unknown	29 (a)	25 (a)	42 (a)	34 (a)		
	Skipjack		Unknown	33 (a)	64 (a)	87 (a)	76 (a)	Moderately exploited	
Northern subtropical	Hake								
	European	Japan, Morocco, etc.	10-15	3	5	3	3	Moderately exploited	70 mm mesh recommended
	Mauritanian/ Senegalese	Portugal, Spain, USSR	About 30	27	32	23	37	Over exploited	
	Sea breams	Greece, Japan, Senegal, USSR, etc.	160	100	128	152	158	Fully exploited	70 mm mesh recommended
	Cephalopods								
	Octopus	Argentina, Rep.of Korea, Greece, Japan, Spain, etc.	(150+))	69	71	59	115	Intensively exploited	60 mm mesh recommended (for protecting under-sized sea breams)
	Cuttlefish		(45) 250	40	21	22	31		
	Squids		(20)) ?	13	14	15	26	Over exploited	
	Sardinellas	Bermuda, Germany (Dem.Rep.of), Norway, Senegal, USSR, etc.		46	657	471	504)		
	Horse mackerels		>1 500	52	297	480	453)	Intensively exploited	
	Mackerel		?	56	224	213	235)		
	European sardine	France, Morocco, Spain, USSR	>500 ?	172	216	241	265	Moderately exploited	
	Anchovy	Morocco	Unknown	...	...	...	...	Slightly exploited	
	Trumpet fish		Unknown	0	0	0	0	Unexploited	
Southern tropical	Inshore demersal	Coastal countries	300 ?	(b)	(b)	(b)	(b)	Locally fully exploited	Mesh size and/or control of fleet size in a few countries
	Off-shore demersal	Coastal countries						Locally moderately exploited	
	Pink shrimp	Coastal countries	20-25 ?	6.4 (c)	8.5 (c)	8.9 (c)	9.8 (c)	Becoming fully exploited	Mesh size and/or control of fleet size in a few countries
	Sardinellas								
	Gambia-Sierra Leone	Bermuda, Ghana, Ivory Coast, Norway, USSR	Included in northern area	(b)	(b)	(b)	(b)	Lightly exploited	
	Ivory Coast/ Ghana	Ghana, Ivory Coast	50 ?	(b)	(b)	(b)	(b)	Fully exploited	
	Gabon, Congo (Angola)	Angola, Congo	some hundreds ?	3 (d)	4 (d)	4 (d)	8 (d)	Lightly/ moderately exploited	
	Mackerel	Ghana, Ivory Coast	Unknown	(b)	(b)	(b)	(b)	Lightly exploited	
	Anchovy	Ghana	Unknown	0	0	(b)	(b)	Lightly exploited	
	Bonga	Coastal countries	Unknown	19	50	54	62	Locally intensively exploited	
TOTAL:				1 220	2 630	2 710	2 920		

(a) ICCAT Statistics referring to the Atlantic as a whole, but majority of fishing occurs off West Africa

(b) Detailed catches unavailable

(c) Cameroon, Congo, Dahomey, Ghana, Ivory Coast, Nigeria only

(d) Excludes catches taken in Southeast Atlantic

southern tropical coastal region. The upwelling of the cool, rich water off northwest Africa makes the coastal waters north of Cape Verde extremely productive and these resources have attracted vessels from most parts of the world. The tropical grounds are generally less productive but still support important local fisheries, especially in areas of seasonal upwelling.

36 The only fisheries carried out in the oceanic areas are for tuna, and the tuna fisheries, especially the longline fisheries, extend from the present region into all the warmer parts of the Atlantic, though the majority of the catches of yellowfin and skipjack are taken in the eastern central Atlantic. The yellowfin appears to be fully exploited but, apart from fluctuations probably due to variations in year-class strength, there are no signs of the total catch being reduced by too intense fishing. At the 1972 meeting of the Council of the International Commission for the Conservation of Atlantic Tunas (ICCAT), a size limit of 3.2 kg for yellowfin was introduced. Introduction of a limitation on yellowfin catches is under consideration. A considerable increase in skipjack catches by more intense fishing is believed to be possible.

37 In the tropical region some localized stocks, especially of shrimp and inshore demersal fish, have become fully exploited. There is no evidence of any significant decline in total catch, although in a few areas demersal stocks have been temporarily over-exploited and there is frequently waste through excess effort. Some countries are seeking to reduce this waste by restricting the size of fleets, particularly the number of fishing vessels.

38 The major problems of heavy exploitation and management occur in the sub-tropical region. As a result of rapid expansion of fishing which took place in the area during the 1960's, several of the more valuable species such as hakes, sea-breams and cephalopods are now intensively, and even in some cases fully exploited. At its meeting at the end of 1972, the Fishery Committee for the Eastern Central Atlantic (CECAF) recommended the use of a 70 mm mesh in the fisheries for hakes and sea-breams and also considered for early adoption the use of larger meshes for cephalopods, some of which (e.g. cuttlefish) appear to be over-exploited.

39 Until 1968 the pelagic stocks in the northern region were less heavily exploited but from 1968 to 1970 there have been rapid increases in the catches (mostly for reduction to fish meal) particularly of sardinellas, chub-mackerel and horse-mackerel. The effect of these increased catches on the stocks cannot yet be assessed in detail and, as in other areas, assessments are made more difficult by the inadequacy of available data. It is likely that catches have not yet reached—although they could be close to it—the level of the maximum potentials. Since 1971, and partly as a result of actions taken by coastal countries regarding access to fishing grounds located off their shores, total catches for these stocks have remained fairly stable, at the level of about 1.2 million metric t annually.

IX INDIAN OCEAN

40 The Indian Ocean contains some of the major stocks, e.g. pelagic fish in the north-western Arabian Sea, which are still only lightly exploited. The heavily exploited stocks consist mainly of the high valued species—tuna and shrimp. Though they differ greatly in their distribution—each of the four major tuna species (with the possible exception of yellowfin) forms probably a single stock, moving widely over the open waters of the Indian Ocean, whereas shrimp form a number of small distinct stocks, each usually confined to the territorial waters of a single country—the status of the stocks is generally very similar. Fishing on each of the tuna species and several of the shrimp stocks has reached a level of full exploitation where additional fishing will not add significantly to the yield.

41 Measures to maintain the catches at a high level have been taken by various governments or national institutions: in the case of tunas, the Japanese fishermen have adopted a system of closed areas to conserve the southern bluefin tuna; for shrimps, some countries have set closures of nursery grounds and closed seasons. In addition, certain countries have either already set limits to the number of vessels allowed in some shrimp fisheries or are actively

Table 8

Indian Ocean

Stocks	Principal countries	Catches ('000 tons)					Status of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
Large tunas	China, Japan, Rep.of Korea, Australia	110	-	105	103	73	Fully exploited	Closed areas adopted unilaterally by Japanese fishermen to conserve southern bluefin
Skipjack	Maldives, Pakistan, Sri Lanka	160-300	-	25 (ca)	25 (ca)	25 (ca)	Moderately exploited	
Demersal fish	Most coastal states	7 500 (b)	-	(a)	(a)	(a)	Mostly lightly exploited	
Shoaling pelagic fish	Most coastal states	6 000	-	(a)	(a)	(a)	Locally moderate to heavy exploitation, e.g. Indian West Coast	
Shrimp	India, Iran, Kuwait, Pakistan, etc.	230	-	183	206	219	Several local stocks fully exploited	Local regulations in operation in some fisheries
TOTAL:		14 000	1 880	2 440	2 720	2 510		

(a) No good data on composition of catches by many countries

(b) Probably too high

Table 9

Western Central Pacific

Stocks	Principal countries	Catches ('000 tons)					Status of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
Demersal Fish								
Northern Gulf of Thailand	Thailand	500	(d)	500 (a)	(a)	(a)	Fully exploited	
Rest of South China Sea	Khmer, Malaysia, Thailand, Vietnam	over 2 000	(d)	(d)	(d)	(d)	Varies. Moderately or heavily exploited near coast	
Java Sea	Indonesia	over 1 000	(d)	(d)	(d)	(d)	Generally lightly exploited	
Philippines	Philippines	600-1 000	(d)	216	217	264	Generally moderately exploited, locally heavily	
Pelagic Fish (excluding tunas)								
South China Sea	Malaysia, Thailand, etc.	probably over 2 000	(d)	(d)	(d)	(d)	Generally lightly exploited	
Java Sea	Indonesia	probably over 1 000	(d)	(d)	(d)	(d)	Generally lightly exploited	
Philippines	Philippines	(b)	(d)	540	561	585	Moderately to fully exploited	
Large Tunas	China, Japan, Rep.of Korea, Philippines, etc.	350-450 (c)	358 (c)	452 (c)	419 (c)	444 (c)	Larger species fully exploited. Smaller species no more than moderately exploited	
Shrimps	Indonesia, Malaysia, Thailand, etc.	300 ?	102	193	231	243	Locally moderately or fully exploited	Local controls on number of vessels, etc.
TOTAL:			2 650	4 170	4 510	4 740		

(a) Some doubt exists on the proportion of the Thailand catch taken in the northern Gulf of Thailand. It is probably not very different from the potential of the area

(b) No explicit estimate available

(c) Figures for larger tunas only, for the whole Pacific

(d) Complete breakdown of catches by species groups and area not available

considering doing so. This should be of considerable economic benefit in preventing the waste that is otherwise likely to occur through the growth of over-capacity of the fleet.

42 Though the demersal stocks, taken as a whole, do not appear to be more than lightly exploited, this may not be true for some local stocks. For example, in the east, trawling, particularly by Thai and Malaysian vessels, has been increasing in the Andaman Sea—Straits of Malacca region—and these stocks may be becoming heavily exploited. In the west it is likely that the reopening of the Suez Canal will increase the amount of fishing in the northwestern Arabian Sea.

X WESTERN CENTRAL PACIFIC

43 Because of the wide areas of continental shelf, which provide a high production of fish, and the vast local human population in the region, for whom fish are a major source of animal protein, this region is potentially one of the most important in the world; however, the great variety of species and the lack of accumulations of fish comparable with those of colder waters have discouraged the development of large industrial-scale fisheries. The fisheries in the region, therefore, (except for tuna) have been carried out almost entirely by countries within the region and, until recently, mainly by small inshore vessels.

44 Except for a few minor local stocks with a restricted distribution, the fish stocks in the region have been generally moderately exploited. Recently the fisheries in several countries, most noticeably Thailand, have been developing rapidly with the introduction of larger and more powerful vessels, improved gear and better marketing and distribution, often as a result of international or bilateral assistance programmes. Some stocks of fish are now fully exploited or even over-exploited, e.g. the demersal fish in the northern Gulf of Thailand, probably local stocks of demersal and pelagic fish round the Philippines and elsewhere, and several local shrimp stocks. Also fully exploited are the stocks of large tuna, or at least those accessible to longline gear. The catches of these species from the Pacific as a whole have recently tended to stabilize around the upper estimate of the potential yield.

45 While some stocks of shrimp and other fish are fully exploited, catches of these groups have continued to expand in the region as a whole as more stocks become more intensely fished. This expansion can still continue for a time; there are now substantial regions, e.g. many parts of the south China Sea, in respect of demersal fish, for which most stocks are likely soon to be close to full exploitation. The greatest potential for expansion appears to be in the waters round Indonesia. The pelagic stocks in the south China Sea probably also offer good opportunities but their potential is not well known.

XI EASTERN CENTRAL PACIFIC

46 This region may be divided into three areas with distinct fisheries: the relatively cool and rich waters of the California current, the coastal tropical areas, and the oceanic waters.

47 The most serious occurrence has been the disappearance of the sardine from the California current region, except for a small stock in the southern part off Baja California. At one time the Californian fishery for sardine was one of the biggest in the world, with peak catches of nearly 800 000 t in 1936-37. Since then catches declined steadily to virtually nothing, and recently all landings in California have been stopped. During the decline there was considerable doubt about its cause, and no effective management action was taken.

48 The doubts about the reasons for the decline have not been fully resolved but it appears most likely that it was a combination of heavy fishing for sardine and the increase (possibly helped by the fishery-induced reduction in sardine) of the anchovy, which is a competitor of the sardine. The most effective management measure would then be a combination of a restriction on the catches of sardine and increased exploitation of anchovy. A fishery for anchovy is now being developed but is restricted by quotas and other controls so that

Table 10

Eastern Central Pacific

Stocks	Principal countries	Catches ('000 tons)					Status of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
California Current								
Sardine	Mexico, USA	20 (470) (a)	21	35	51	60	Depleted	Landing prohibited in USA
Anchovy	USA	2 000 (f)	3	87	40	77	Light	Catch quotas set in USA
Jack mackerel	USA	300-800	30	22	27	24	Light	
Mackerel	Mexico, USA	?	11	0.7	0.6	0.5	Moderate ?	
Demersal	-	400	(h)	(h)	(h)	(h)	Light	
Tropical Waters								
Anchoveta	Mexico, Panama	> 100	42	34	58	22	Moderate	
Other pelagic	Mexico, etc.	500-1000	(b)	(b)	(b)	(b)	Virtually unexploited	
Demersal	-	500	(g)	(g)	(g)	(g)	Light or moderate	
Shrimp	Mexico and most other coastal states	75	61	71	77	75	Mostly fully exploited	Limits on numbers of vessels in some countries
Oceanic Areas								
Yellowfin tuna	Ecuador, Japan, Puerto Rico, USA	100 (c)	97	151 (d)	125 (d)	165 (d)	Fully exploited	Catch quotas set by I-ATTC
Skipjack tuna	Ecuador, Mexico, Puerto Rico, USA	250	76	58 (e)	82	55	Moderate	
TOTAL:			600	880	910	910		

(a) Sustainable yield under present conditions estimated as 20 000 tons, but if stocks had remained at high levels occurring around 1930, an annual sustained yield of 470 000 tons should have been possible

(b) No exact figures available, but total catch not more than a few thousand tons

(c) 1968 estimates for the I-ATTC area; subsequent events suggests that this is too low

(d) Includes catches outside the I-ATTC regulatory area

(e) Skipjack catches vary quite considerably from year to year, presumably from environmental causes. 1970 was a poor skipjack year. In 1967, 107 000 tons were taken

(f) Probably lower when sardines were abundant

(g) Substantial quantities caught in the shrimp fisheries, mostly discarded at sea

(h) Detailed statistics not available, but catches small, except for hake (discussed under Northwest Pacific)

Table 11

Southwest Atlantic

Stocks	Principal countries	Catches ('000 tons)					Status of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
		(a)						
Demersal								
Brazilian coast	Brazil	400	(b)	131	151	182	In north lightly, elsewhere moderately or heavily exploited	
Pelagic								
Brazilian coast	Brazil	500	(b)	183	204	229	Generally lightly, but sardine moderately exploited	
Hake	Argentina, Brazil	800	102	108	116	134	Lightly exploited	500 000 tons taken by USSR in 1967 without obvious effect on stocks
Poutassou								
S.Patagonian shelf	-	1 000	-	-	-	-	Virtually unexploited	
Various Demersal Fish								
Argentine-Uruguay coast	Argentina, Uruguay	500	(ca 50)	(ca 50)	(ca 50)	(ca 50)	Generally lightly exploited	
Anchovy	Argentina	1 000	17	14	20	41	Very lightly exploited	
Herring								
S.Patagonian shelf	-	1 000	-	-	-	-	Virtually unexploited	
Prawns	Brazil	60	40	37	37	37	Most stocks moderately to heavily exploited	
TOTAL:			520	1 060	760	760		

(a) Estimates of potential revised on the basis of analyses by CARPAS/ACMRR Working Party, and during a Training Centre/Working Group on Stock Assessment in Brazil, March 1974

(b) Detailed statistics not available

the present catches are probably having a negligible effect on the stock. The chub-mackerel stock also appears to have seriously declined, probably due to heavy fishing, while the jack-mackerel stock appears only lightly exploited. The California current system therefore exhibits, in a marked fashion, the oscillations of different pelagic stocks that appear elsewhere, e.g. off Japan and southern Africa. Because only sardine has been the subject of a large fishery, the pelagic resources as a whole are under-exploited and production could be greatly increased.

49 In the tropical coastal areas the fish stocks are generally only lightly exploited, but many of the local stocks of the main penaeid species are fully exploited. In many of the local fisheries there are considerable opportunities for economic gain by reducing the over-capacity of the fleets and in some, but not all, countries regulations to achieve this have been introduced. More use might also be made, under favourable conditions, of the incidental catches of fish taken in the shrimp fisheries.

50 In the oceanic areas, yellowfin and skipjack tuna support an important fishery. Analyses by the Inter-American Tropical Tuna Commission (IATTC) have shown that the group of yellowfin exploited by the classical fishery of the 1950's (bait-boats, operating relatively close to the American continent) was heavily fished and increased fishing along the established pattern would not yield increased catches. Since their basic analyses were made, the pattern of fishing has changed. The introduction of large purse-seiners has developed fishing much further westward and resulted in larger tuna being caught. Probably as a result of these changes, the potential yield of yellowfin from the region under the present type of fishing is well in excess of the original estimates. The value is not known very precisely but the experimental management regime of IATTC (under which total catch limits have been set each year since 1966) is allowing cautious expansion which will allow better evaluation in the near future. In addition to some uncertainties on the status of the yellowfin stock, IATTC is also experiencing difficulties in reaching agreement on the details of the management regime which will allow the interests of the different participants to be met. Although skipjack are believed to be under-exploited, the catches have fluctuated and have not shown any clear tendency to increase.

XII SOUTHWEST ATLANTIC

51 Taken as a whole the stocks in this area are no more than moderately exploited, and some major stocks, e.g. anchovy and poutassou, are virtually unexploited. Local exploitation may be more intense. For example, lobster off northeastern Brazil, shrimp off central south Brazil, and corvina and pescadinha real off south Brazil and Uruguay may now be heavily exploited. Off north Brazil and along the Uruguay-Argentina coasts, however, the problems of fisheries are those of lack of development and under-exploitation rather than of too heavy fishing.

52 There are a number of reasons for this: the first is that, particularly in the south where the fish resources are richest, the demand for fish is slight, there being very good local supplies of meat. Secondly, this southern area is very far from the bases of the long-distance mobile fleets of, for example, the U.S.S.R. and Japan, so that long-range fishing in the area did not start on any significant scale until about 1966. Then a considerable fishery for hake was developed by the U.S.S.R., with some other countries sharing interest. Catches by the U.S.S.R. exceeded a half-million t in 1967, most of which were taken within the 200-mile limit claimed by Argentina. These foreign catches had fallen to virtually nothing by 1969. Catches of this magnitude do not seem to have had any pronounced or serious effect on the stock and were probably less than the annual sustainable yield. Certainly the hake stock, taken as a whole, as well as the anchovy and some other stocks, have so far been grossly under-exploited but the hake fishery is now developing.

XIII SOUTHEAST ATLANTIC

53 The upwelling of cool nutrient-rich water caused by the Benguela current makes the fishing grounds off southwestern Africa among the most productive in the world; however,

Table 12

Southeast Atlantic

Stocks	Principal countries	Catches ('000 tons) (b)					Status of exploitation	Management measures
		Estimated potential	1960	1965	1970	1971	1972	
Hake	Japan, South Africa, Spain, USSR	620 (a)	111	332	709	779	1 115	Fully exploited	Mesh size limits set by ICSEAF
Pilchard: Southern stock	South Africa	150-300	318	203	40	65	62	Depleted	Catch quotas set by South Africa
Northern stock	Angola, South Africa, USSR	1 000	293	777	566	328	447	Fully exploited or depleted	Catch quotas set by South Africa
Horse Mackerel	Angola, South Africa, USSR	800	152	307	229	383	346	Moderately exploited	
Anchovy	South Africa	650	-	178	404	394	417	Becoming more fully exploited	
Sardinella	Angola	some hundreds	33	43	71	89	145	Moderately exploited	
TOTAL:			1 148	2 195	2 479	2 315	2 796		

(a) This estimate needs review

(b) Data from ICSEAF Statist. Bull. 2, March 1974

Table 13

Southwest Pacific

Stocks	Principal countries	Catches ('000 tons)					Status of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
Rock Lobster W.Australia	Australia	8	7.4	6.9	8.1	8.3	Fully exploited	Size limits; licence limitation
S.E.Australia	Australia	5	4.5	4.7	4.8	4.7	Fully exploited	Size limits
New Zealand	New Zealand	6	5.0	6.6	5.7	4.6	Fully exploited	Size limits
Demersal Fish	Australia, Japan, New Zealand	(a)	38	42	60	105	Moderate in some areas	
Pelagic Fish	Australia, Japan, New Zealand	(a)	22	35	54	72	Light	
Tunas	Australia, Japan	(b)	32	115	94	82	Larger species heavily exploited	Controls on Japanese southern bluefish fishery
TOTAL:			120	220	240	290		

(a) Potential not well established, but in the region as a whole, probably in the order of a million tons for both pelagic and demersal

(b) Potential of large tunas in the whole Pacific discussed under Western Central Pacific

Table 14

Southeast Pacific

Stocks	Principal countries	Catches ('000 tons)					Status of of exploitation	Management measures
		Estimated potential	1965	1970	1971	1972		
Anchoveta	Chile, Peru	9-11 000	7 680	13 060	11 240	5 415	Fully exploited	Peruvian fishery controlled by a variety of measures
Sardine	Chile	160	50	69	181	180 (a)	Moderately to fully exploited	
Hake	Chile, Peru	200	106	105	93	99	Moderately to fully exploited	
Other fish	-	some hundreds	(b)	(b)	(b)	(b)	Mostly lightly or unexploited	
Squid	-	some hundreds	0.4	0.8	0.9	0.8	Unexploited	
TOTAL:			8 270	13 730	12 020	6 220		

(a) Estimated

(b) Separate data not available

the distance from other major fishing countries has meant that until comparatively recently exploitation was limited to the local fleets of South Africa and Angola. With only restricted markets, the stocks were generally under-exploited, except for those supplying export markets for canned pilchard, fish meal and frozen lobster tails. Management problems have, therefore, until recently, principally concerned pilchard and rock lobster.

54 The fishmeal fisheries have had a complex history. Though, except for the separate fishery off Angola, initially the whole catch has been taken by South African vessels, three separate sets of controls have been in operation. These have been: first, those set by the South African vessels exploiting the local stocks close to the Cape of Good Hope; secondly, the controls on the fishery by small vessels supplying the fisheries in and near Walvis Bay, which are set by the local administration; and thirdly, the controls set by the South African Government on the large factory ships (converted whale factory ships) which, though based at Cape Town, principally operated in the Walvis Bay area.

55 Despite the controls the southern pilchard stock has declined to a low level. The reasons are not too clear but are probably a combination of heavy fishing and competition with anchovy, similar to that which occurred in California. Off Walvis Bay catch quotas were allocated to individual companies. Though these quotas were in total less than the potential sustained yield from the stock, they allowed a highly profitable fishery to be maintained for a considerable period. In 1966 factory ships started operating in the area and catches rose to a peak of 1.4 million t in 1968. Since then the stock has declined, possibly through depletion of the stock by too heavy fishing. As the pilchard stocks declined, an increasing proportion of anchovy has been used in the fishmeal factories, though the anchovy stocks are probably still not fully exploited. More severe controls, including the phasing out of the factory ships, have greatly reduced the catches of pilchard, while encouraging increased fishing for anchovy. It seems that very recently there has been some increase in pilchard. In the most northern part of the region, off Angola, important pelagic stocks are horse-mackerel and sardinella, which appear to be moderately exploited.

56 The principal species of demersal fish in the area is hake. Hake are found from southern Angola south to the Cape of Good Hope but, until the development of the long-range fisheries of Japan, Spain, U.S.S.R. and other countries in the early 1960s, was only harvested to any significant extent at the southern extremity of its range. Total catches rose rapidly until 1968 and appeared to have reached a plateau of ca. 750 000 t between 1968 and 1971, but increased again (mainly due to increased catches by the U.S.S.R.) in 1972. It appears that the stocks are now heavily exploited. Regulations on the minimum mesh size for trawls have been introduced by some individual governments and a similar regulation was adopted by the International Commission for the Southeast Atlantic Fisheries (ICSEAF) in 1973-74.

XIV SOUTHWEST PACIFIC (INCLUDING AUSTRALIAN COASTAL WATERS IN THE INDIAN OCEAN)

57 This is one of the least heavily exploited regions of the world. The only coastal stocks of major commercial importance that are clearly heavily exploited are the highly valued crustaceans—rock lobsters. The oceanic stocks of large tuna fished by longliners are probably also heavily exploited.

58 In all parts of the area the catch of lobsters has been maintained at a high level by local state or national regulations concerning the size of animals that can be landed. In some areas this is supported by specifications of the type of gear such as the use of escape gaps in the pots. In western Australia there is also a regulation on the number of vessels licensed to fish for lobster. This control of the capacity of the fleet has had considerable economic benefit for the fishery.

59 The lack of much large-scale fishing has inhibited detailed evaluation of the other resources. In view of the large extent of the region, it can be expected that the total, and the relatively small present catches, can be greatly increased. Recently there have been significant increases in catches by local-based and long-range fleets, and some local stocks, e.g. certain demersal stocks off New Zealand and southeast Australia, are heavily exploited.

Table 15

Marine mammals

(a) Whales

	Principal countries	Sustainable Catch (f)		1970 catch	1971 catch	1972 catch	Status of exploitation	Management measures
		Maximum	Current					
Blue Whale								
Antarctic	-	6 500	Very small	10	-	-	Severely depleted	Catching banned by IWC
Elsewhere	-	1 000 (b)						
Fin Whale								
Antarctic	Japan, USSR	10 000	3 200	3 000	2 890	2 680	Depleted	Quotas set by IWC
Elsewhere	Japan, USSR	3 000 (b)	1 000-1 500 (b)	2 060	1 660	1 510	Depleted	Quotas set by IWC in North Pacific
Humpback Whale	-	Some hundreds	Very small	20	20	10	Severely depleted	Catching banned by IWC
Sei Whale								
Antarctic	Japan, USSR	5 000	4 500	5 860	6 150	5 460	Fully exploited	Quotas set by IWC
Elsewhere	Japan, USSR	3 500-4 000 (b)	3 500-4 000 (b)	5 560	4 310	3 140	Fully exploited	Quotas set by IWC in North Pacific
Minke Whale	Japan, Norway, USSR	5 000-12 000 (d)	(c)	3 810	4 060	7 010	Lightly to moderately exploited	Quotas adopted by IWC in the Antarctic
Right Whale	Greenland, USA	Some hundreds of animals?	Some tens of animals?	(a)	(a)	(a)	Depleted	Catching banned by IWC
Sperm Whale	Australia, Japan, Peru, South Africa, USSR	25 000	(c) (e)	26 270	22 900	17 470	Generally moderately to fully exploited	Pelagic quotas set by IWC
Pilot Whale	Faero Islands, Japan	Unknown	-	740	1 210	600	Lightly exploited most areas	

(a) A few animals taken in the Arctic for local consumption; these are exempt from the IWC ban

(b) Approximate figures, summing contributions from a number of different stocks in the North Pacific and North Atlantic

(c) Stocks in most areas above the levels giving maximum sustainable catch

(d) Rough estimate for Antarctic only

(e) Actual value of sustainable yield depends on the balance between male and female animals in the catch

(f) Based on estimates by IWC. These are currently under review by several groups including the ACMRR Working Party on Marine Mammals

(b) Smaller cetaceans and seals

	Principal countries	Sustainable Catch		1970 catch	1971 catch	1972 catch	Status of exploitation	Management measures
		Maximum	Current					
Smaller Cetaceans								
Porpoises/ dolphins	Japan, Turkey, USA	Unknown	Unknown	(a)	(a)	(a)	Unknown	
Seals								
N.Pacific Fur Seal	Canada, Japan, USA, USSR (c)	70 000 (b)	70 000 (b)	58 500	47 200	48 900	Was depleted, now restored	Harvesting controlled by INPFSC
Cape Fur Seal	South Africa	80 000 (b)	80 000 (b)	85 800	76 500	80 500	Fully exploited	Harvesting controlled by local administration
S.American Fur Seal	Uruguay	10 000 (b)	10 000 (b)	11 900	12 700	10 500		
Harp Seal (N.W.Atlantic)	Canada, Greenland, Norway	Probably some hundreds of thousands	150 000	293 500	264 300	151 400	Somewhat depleted	Catch quotas set by ICNAF

(a) Catches include large numbers (probably tens or hundreds of thousands) taken incidentally in tuna fisheries, as well as a few local fisheries specifically for porpoises

(b) No precise estimate. Current population levels probably not far from those giving the maximum sustainable yield

(c) Under current agreements major harvesting carried out by USA and USSR

XV SOUTHEAST PACIFIC

60 The fisheries in this region are dominated by the anchovy fishery of Peru and Chile, the biggest single-species fishery in the world with a potential sustained yield of the order of 9-11 million t. This fishery expanded rapidly in the early 1960's and, by the middle of the decade, catches in the Peruvian fishery were approaching the productive capacity of the resource. A variety of measures have been introduced by the Peruvian authorities to ensure the conservation of the stocks. These include an overall catch quota, closed seasons, both around the main spawning season and when the catches would contain a large proportion of small, young fish, as well as other restrictions, e.g. on fishing on certain days during the open season. These have kept the catches and season within the limit generally recommended on scientific grounds.

61 In 1972, during an incursion of warm water—el Niño—the stocks off Peru appear to have fallen to a very low level and severe restrictions on the fishery have had to be introduced. The 1972 catch was less than half the average of the previous years. The immediate cause of this failure is undoubtedly environmental, but its effect was probably increased as a result of the reduced size of the adult spawning stock due to fishing. The stocks did not recover in 1973 so that fishing was reduced even further, to a catch of about 2 million t. El Niño terminated by mid-1973 and there are indications that the stocks are now recovering though there still seems to be a scarcity of small fish. As a precautionary measure, the government limited the catches for the first half of 1974 to 2 million t. The allowable catch for the remaining part of the year will be determined on the basis of continuing research.

62 Another aspect of the management of the Peruvian fishery concerns the very great reductions in costs that can be obtained by eliminating the excess capacity of the fleet and the shore facilities which existed in 1972. Since the nationalization of the anchovy fishing industry in 1973, steps have been taken to reduce drastically this excess capacity, both of vessels and factories. This is expected to result in considerable economic benefits.

63 Apart from the anchovy, some other stocks such as hake off Chile, and possibly also sardine and bonito, are also fully exploited; however, there are also other substantial stocks, e.g. hake off northern Peru and cephalopods, that are nc more than moderately exploited.

XVI MARINE MAMMALS

64 The conservation and management of marine mammals has received a great deal of attention in recent years. There are a number of reasons for this. Unlike that of fishes, the potential reproduction rate of marine mammals is low—for large whales one young every other year—so that the exploitation rate can easily exceed the ability of the stock to replace itself. Without suitable regulation, this will lead to a progressive decline in the stock and the collapse of the industry exploiting it.

65 Public interest in the biology and behaviour of marine mammals, and hence in their harvesting, has also been greatly increased by the greater awareness of their high intelligence, particularly of porpoises and dolphins, and by the display of these animals in aquaria. A point of view has developed that any deliberate killing of marine mammals is morally undesirable. This is outside the scope of the present note. Of more relevance are the probable interactions between marine mammals and present fisheries. Seals and others are important predators of many valuable commercial fish, and fishermen often press for a reduction or control of the numbers of seals. Conversely, the reduction by fishing of the abundance (though not necessarily the production) of many species of fish may affect the food supply of some species of marine mammals, and this could have as serious an effect on these stocks as carefully controlled harvesting.

Whales

66 Several species of large whales have been major objectives of hunting at different times. Right whales and, later, sperm whales were killed from open boats by hand harpoons—and still are in certain areas. Later industrial-scale whaling with harpoon guns and factory ships has been principally based on the large baleen whales—blue, fin, humpback and sei whales. Intense hunting between the sixteenth and nineteenth centuries brought the stock of right whales in both hemispheres close to extinction. By the late nineteenth century right whales were so few that the commercial whaling for them stopped.

67 Sperm whales were intensively hunted from open boats in the eighteenth and nineteenth centuries but the industry declined in the mid-nineteenth century. This was probably because of the development of petroleum production, and the reduced market for sperm oil, and at that time there was no indication that the stocks had been seriously depleted. In the present century sperm whales have been hunted by modern whale catchers operating both from shore stations and from factory ships (particularly in the north Pacific). Sperm whales apparently form a number of distinct stocks and, although taken as a whole, the world population of sperm whales is probably somewhat larger than that giving the maximum sustainable yield, certain local stocks (e.g. those off western South America) are depleted. Catch quotas have been set by some countries for local fisheries, and also the International Whaling Commission (IWC) has set quotas for the Antarctic and the north Pacific.

68 During the present century the chief objectives of commercial whaling have been the larger species of baleen whales, particularly in the Antarctic. Blue and humpback whales have been especially vulnerable to over-exploitation, the blue whale because it is the largest and most valuable, and the humpback because it occurs in some localized areas. Some ten years ago it was clear that both species were severely depleted in all parts of the world. Since then catching of these species has been prohibited by IWC, and there are indications that both may now be increasing, at least in some areas.

69 After the decline of the blue whale stocks, the main species sought was the fin whale, and later the sei whale. Although limits to the total catch in the Antarctic had been set by IWC since 1946, they had not been low enough to prevent a progressive decline in the fin whale stocks until by 1965 they had been depleted substantially below the level giving the maximum sustained yield. The IWC, after some years of argument, finally agreed to large reductions in the catch quotas. The effects of these reduced catch quotas are not known precisely, though it is clear that the catches of both fin and sei whales are now only small fractions of the present stocks. That is, since 1965 there probably has been little change in the abundance of these stocks in the Antarctic, the fin whales remaining depleted, though without further deterioration in their situation, and the sei whale stocks being maintained not far from the level giving the maximum sustained yield. The situation in the north Pacific is similar. The most recent catch quotas set by IWC should maintain the sei whale stocks near to the optimum (MSY) level but the fin whale stocks are depleted, and the quotas do little more than prevent further depletion.

70 The smaller whales (minke whales and pilot whales) are only exploited locally and there are few signs of any depletion of the stocks. In the Antarctic the IWC has set precautionary catch limits for minke whales though large-scale exploitation has only recently started.

Smaller cetaceans

71 The deliberate hunting of smaller cetaceans (dolphins and porpoises) is restricted to a very few areas, such as round Japan. The greatest number of animals killed are probably those taken incidentally in the purse-seine fishery for tuna, particularly that in the eastern tropical Pacific. Tuna fishermen use porpoise schools as a guide to the presence of tuna when setting their nets, and numbers of porpoises are entangled in the nets and drowned. Estimates of the numbers involved go as high as some hundreds of thousands of animals. The effect on the stocks is not known. Certainly the stocks are very large and could sustain quite large removals. Also, although the large catches of porpoises have

been occurring for several years, there is no sign of any significant decline in stock abundance; however, a slow decline might be occurring which, if continued for a period without any check, could cause serious damage to the stocks. Investigations are now being made to determine the actual status of the porpoise stocks. In addition changes in the design of the net and the technique of fishing, which could reduce or eliminate the numbers killed accidentally, are being developed and implemented.

Seals

72 During the eighteenth and nineteenth centuries widespread uncontrolled hunting of seals for fur brought many such stocks throughout the world to a very low level. Some stocks were very nearly wiped out and, though most are now recovering, several cannot yet support large-scale harvesting. Others have been successfully managed, most strikingly the fur seal of the north Pacific. Most seals are only vulnerable to commercial exploitation when concentrated in well-defined breeding places, usually small islands, so that their management involves fewer problems than those of fish stocks exploited over a wide area; however, the north Pacific fur seal was once subject to intense hunting on the high seas (the so-called pelagic sealing). This was brought to an end in 1911 by an agreement between Canada, Japan, Russia and the U.S.A., whereby sealing was, with minor exceptions, restricted to a carefully controlled take on the breeding islands by the governments concerned (Russia and the U.S.A.), a share of the skins being given to Canada and Japan. Under this agreement, renewed in various forms since 1911, the fur seal stocks have been restored from a very low level close to the level giving the maximum sustainable yield. Fur seal stocks are also being harvested at rates giving high sustained yields in South Africa and Uruguay.

73 Another species of seal that is harvested in substantial numbers by more than one country is the harp seal in the north Atlantic. This seal breeds in early spring on the ice fields, largely outside territorial waters. Agreements have been reached between the U.S.S.R. and Norway (as regards the northeast Atlantic) and, within the framework of ICNAF, between Canada, Denmark and Norway, as regards the northwest Atlantic. The latter agreement has only been in operation for a short time and, though catches have been reduced, this reduction has so far only been sufficient to slow down, and not to revert, the depletion of the stock.

XVII INLAND WATERS

74 Inland waters account for about 12% of all marketed catches. Subsistence fisheries are estimated to be of the order of 50% of the marketed inland catches. Detailed information on the state of inland stocks is, however, generally not available. Estimates of the upper limits of permissible catches have been given for certain stocks and water bodies, but in many areas reliable catch statistics have not been obtained owing to the difficulty of monitoring the highly scattered landing points.

75 Fish culture is particularly well developed in inland regions and accounts for a large segment of freshwater fish production. In the following reviews, however, only the status of wild and semi-wild stocks is considered. Also partly ignored are the resident stocks of brackish lagoons and estuaries; diadromous stocks fished in inland areas are included in the catch.

Europe

76 Wild fish stocks in European inland waters have been considerably damaged by pollution. There are considerable areas of fishless river in most countries and in others only small stocks of cyprinid fishes have survived. Polluted conditions have resulted in the disappearance of historically recorded runs of anadromous fishes and the eutrophication of many lakes has led to a change from salmonid to coregonid-based populations. European waters produced about 400 000 t of cyprinids, sturgeon, eels, coregonids and salmonids in 1972 (including the catch from European U.S.S.R.). About one half of this comes from extensive fish culture which compensated for the increasing depletion of natural stocks due to environmental stress.

Africa

77 Inland fisheries are important in many parts of Africa, with the main centres of production being in the area of the Niger River, Lake Chad, and the lakes of East Africa. About 1 100 000 t of freshwater fish were caught in Africa during 1970, and further increases can be anticipated in the future as the potential is estimated as at least 1 800 000 t. On the average, therefore, African inland waters are generally moderately exploited. Relatively unexploited areas such as Lake Tana, the Ethiopian Rift Valley lakes and the Malagarasi and Upper Chari swamps still exist. On the other hand there are indications that some lake systems such as Kainji and Mweru are heavily exploited. Some individual stocks, such as the Tilapia esculenta of Lake Victoria and the Lates species of Lake Tanganyika, show signs of depletion despite the fact that the lakes containing them are generally only moderately exploited. Particularly hard hit are migratory potamodromous species, such as the various species of Labeo and large Barbus which provided the basis for seasonal dam fisheries. These have either been brought to the verge of extinction by excessive fishing or by the blocking of their migratory pathways by dams. Environmental changes induced by climatic factors have reduced water areas and fish populations in the Sahelian zone, particularly in the central Delta of the Niger River and in Lake Chad.

Asia

78 Little information is available on the state of inland fisheries in Asia despite the high estimated production of 6 800 000 t annually including 4.8 million in China. Of this total about half is derived from aquaculture, the remainder coming from the great river systems of Asia together with some large lakes. The number of reservoirs is being augmented by the flood control and irrigation dams being built on the Mekong system. On the whole Asian inland fishery resources are probably fished at or near their potential and some sign of depletion has been noted from the Grand Lac of Cambodia where catches have fallen in the last few years. The diminution of stocks of coregonids in Lake Baikal through environmental stress is also giving cause for concern.

South America

79 With a reported catch of 234 000 t, the inland waters of South America are almost certainly generally only lightly exploited although there is little information available to serve as a basis for more objective judgement, particularly for such large systems as Amazon and Parana. Only the stocks of certain waters show local depletion. Some small rivers of Colombia, for example the Sinu, are now virtually fishless due to excessive use of dynamite, and the trout stocks of Lake Titicaca have been fished to a point where catch levels are seriously impaired.

North and Central America

80 There are very large inland water resources of the North American continent, totalling over one million square kilometers in surface area. Perhaps 60% of these waters, for reasons of climate and inherently low productivity, must be regarded as poor in potential fish yield. There are important commercial fisheries, especially for salmonid species. Sport fisheries are responsible, however, for the largest portion of an estimated total freshwater yield of one-half million t per year. There is considerable evidence of economic damage by pollution to both the commercial and recreational values of those portions of the fishery resources occurring in the heavily populated and industrial regions, while overfishing seems to be a major factor only with respect to certain of the most valued and/or most susceptible stocks and is most characteristic of the "cold-water" species. Thus, while the average yield for the continent appears to be only around 5 kg/ha in the inland waters, it seems likely that these resources are, in the U.S.A. and Canada, fully exploited or nearly so. An appreciable part of the catch, particularly in the U.S., comes from hatchery-reared fish released for sport fishermen.

81 On the other hand, opportunities for expanding production from wild or semi-wild stocks are much more apparent in Mexico and the other countries of the continent which have a much smaller portion of the total inland water. The potential yields in the more tropical climates are expected to be substantially higher for given area of water. Estimates of both the present yields and the potentials are, however, quite unreliable. The recorded landings include about 20 000 t from the inland waters, which cover about 20 000 km^2. Some of the natural lakes are already heavily exploited while incipient or threatened deterioration of the potential fish yields of both these and the large number of artificial lakes is resulting from the growing pressure on both the land and water resources for agricultural and industrial development. On the whole, however, this portion of the inland waters of the continent can be regarded as only lightly to moderately exploited.

Summary of the status of inland waters

82 The causes of stress to the fish stocks of fresh waters are often associated with environmental changes which in some cases diminish the yield of all fish stocks in an area while, perhaps more often, altering the proportion of different species in the total catch. Such environmentally stressed fisheries are most common in the industrialized nations, but changes in the fish stocks of rivers and lakes, resulting from the construction of dams and other human activities, may be found in nearly all countries. Overfishing occurs in fresh waters but, as inland fisheries are generally based on a number of species, local overfishing of some stocks usually co-exists with the comparative under-exploitation of others.

XVIII SUMMARY AND DISCUSSION

83 The preceding sections have reviewed, very briefly, the present status of the major fish stocks of the world. Particular attention is given to those which have become heavily exploited but, to give a better general impression of the state of development of the fisheries in each region, mention is also made of the more important stocks which are still only lightly or moderately exploited and from which increased catches could be obtained by more intense fishing. Though the details differ from region to region, there are a number of general features that occur in most regions.

84 The most obvious is that very many—probably the majority—of the more attractive stocks, such as the larger demersal species, lobsters, shrimps, the larger tunas and the more abundant shoaling pelagic fish, are now fully exploited. In some instances over-exploitation has reduced stocks to very low levels, so that catches are very small. The most obvious examples have been many stocks of whales or other marine mammals which are highly vulnerable because of their low reproductive rate. Some fish stocks, e.g. Atlantic-Scandinavian herring, are also at very low levels though the precise reason for the decline in any particular case is not always clear. Various causes have been advocated to explain such collapses, e.g. sudden changes in the environment, longterm fluctuations in hydrobiological conditions or in composition of natural populations, and heavy fishing. In several cases it is believed more than one factor is responsible but seldom can the respective role of the various causes be assessed. For other stocks (including many demersal stocks) catches, though still large, are smaller than they might be under a better management regime.

85 In very many fisheries, even when the total catch has not been reduced by too intensive exploitation, there is considerable economic waste (commonly up to 50% of the total costs of the fishery) through the existence of excess capacity. In these fisheries there would be significant benefits from the introduction of suitable management measures such as the control of the amount of fishing; other measures, e.g. the protection of small fish, are also likely to be beneficial.

86 Events since the preparation of the first version of this paper have tended to confirm these general impressions. Some features of the fisheries in 1971-72 (and where information is available, also of 1973) are worth noting. Most conspicuous has been the decline, hopefully only temporary, of the Peruvian anchovy (see paragraph 61). No other major fishery has suffered such a decline in this period, though in the past other large pelagic fisheries

have collapsed. In fact a number (Atlantic menhaden, British Columbia herring, sardine in the southeast Atlantic) seem to be recovering, in some cases following the implementation of drastic management measures.

87 The expansion of fisheries on several stocks that were clearly under-exploited in 1970 has continued. For some, e.g. Alaska pollack in the north Pacific, mackerel in the northwest Atlantic, current catches may now be near the limit of the potential of the resource. Others, e.g. hake in the southwest Atlantic, may still allow greatly expanded catches or, as is probably the case of some pelagic stocks in the Arabian Sea, permit the establishment of major new fisheries. In short, a number of additional stocks have become heavily exploited since the last review while several stocks of the more familiar types of fish still remain under-utilized. They may be expected, if current trends continue, to come under fuller exploitation in the near future.

XVIX SUGGESTED ACTION BY THE COMMITTEE ON FISHERIES

88 This report does not include any discussion of the so-called unconventional resources such as krill. There seems little doubt that some of these resources are very large, e.g. the lower figures quoted among the range of estimates of potential annual yield of krill from the Antarctic, in some tens of millions of tons. For the present it is as difficult to obtain quantitative estimates of the resources as it is to develop effective and economic methods of harvesting these resources.

89 The implication of this review, as regards possible action by FAO or Member Governments, are discussed elsewhere (COFI/74/5), as well as in COFI/74/6 and 7 as regards regional bodies. The Committee may wish to comment here on the general value to its deliberations of this type of review (which were in fact welcomed by the Eighth Session, paragraphs 36-38 of its report), and on its format. These comments could take into account the changes made from the first review towards including longer series of statistical data (with, in some cases, averages over periods of several years) and the possibility of putting more emphasis on developments in the fisheries since the previous review. The Committee may also wish to comment on the review given here of the status of inland fishery resources, which was not included in the previous review.

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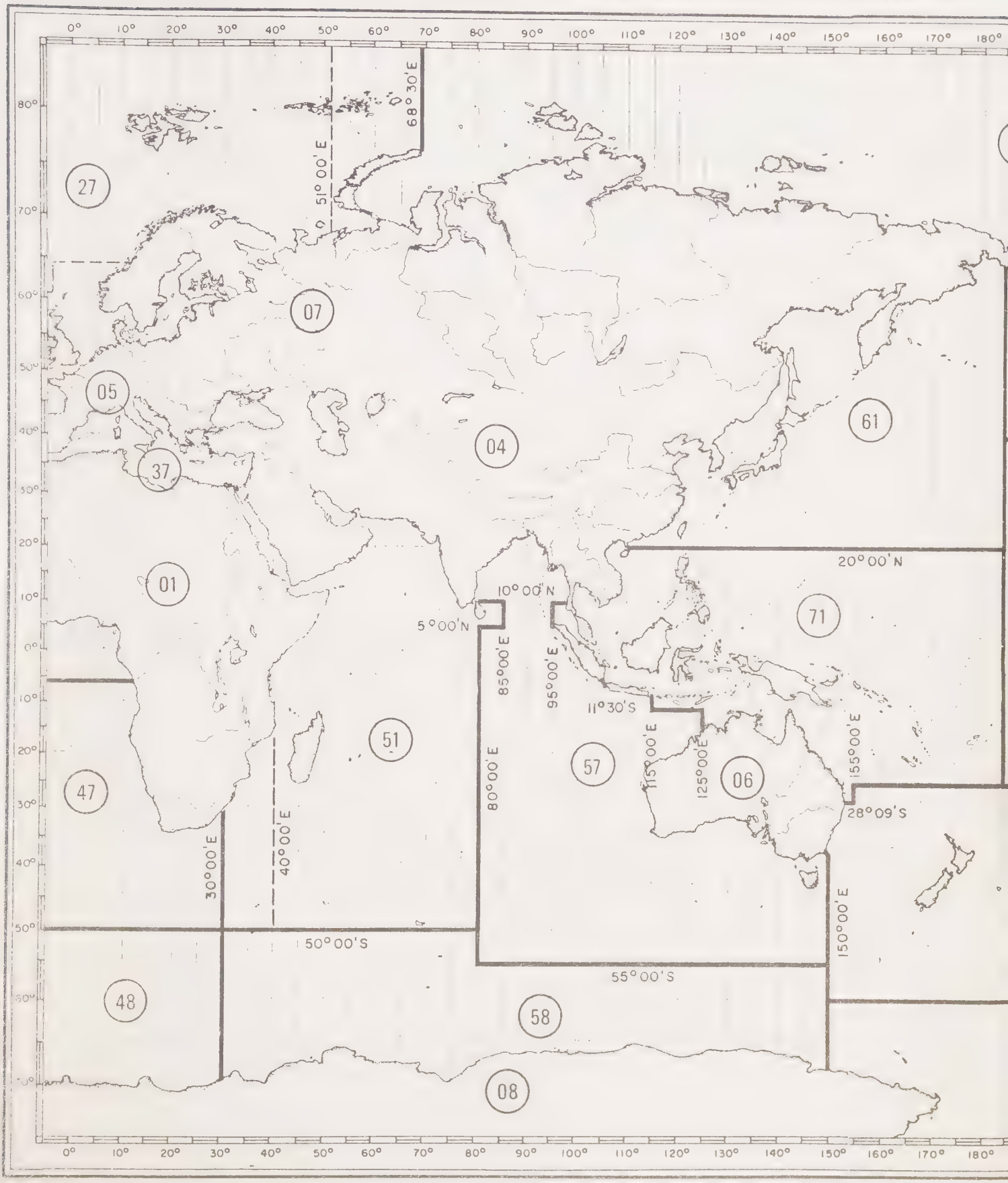
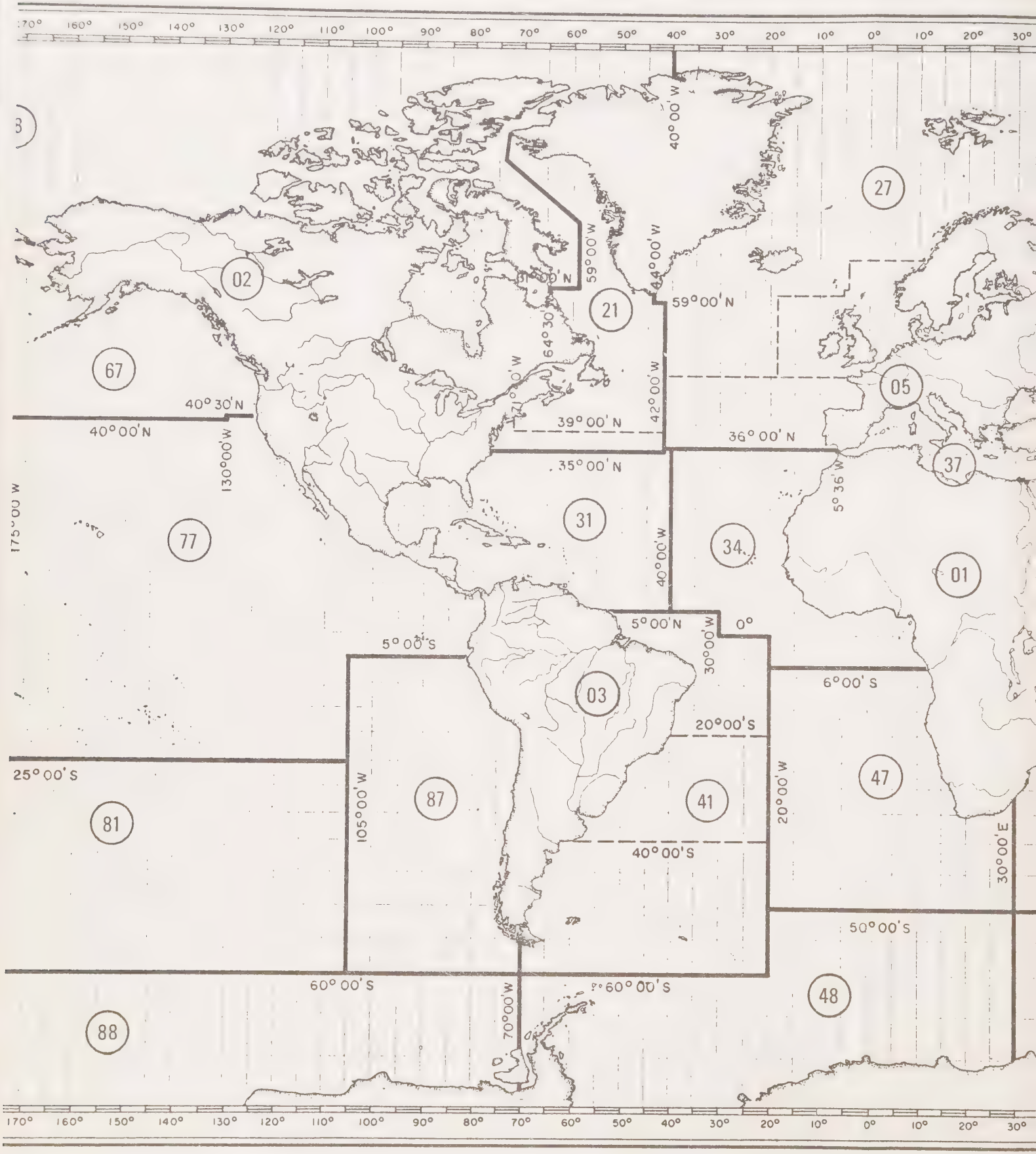
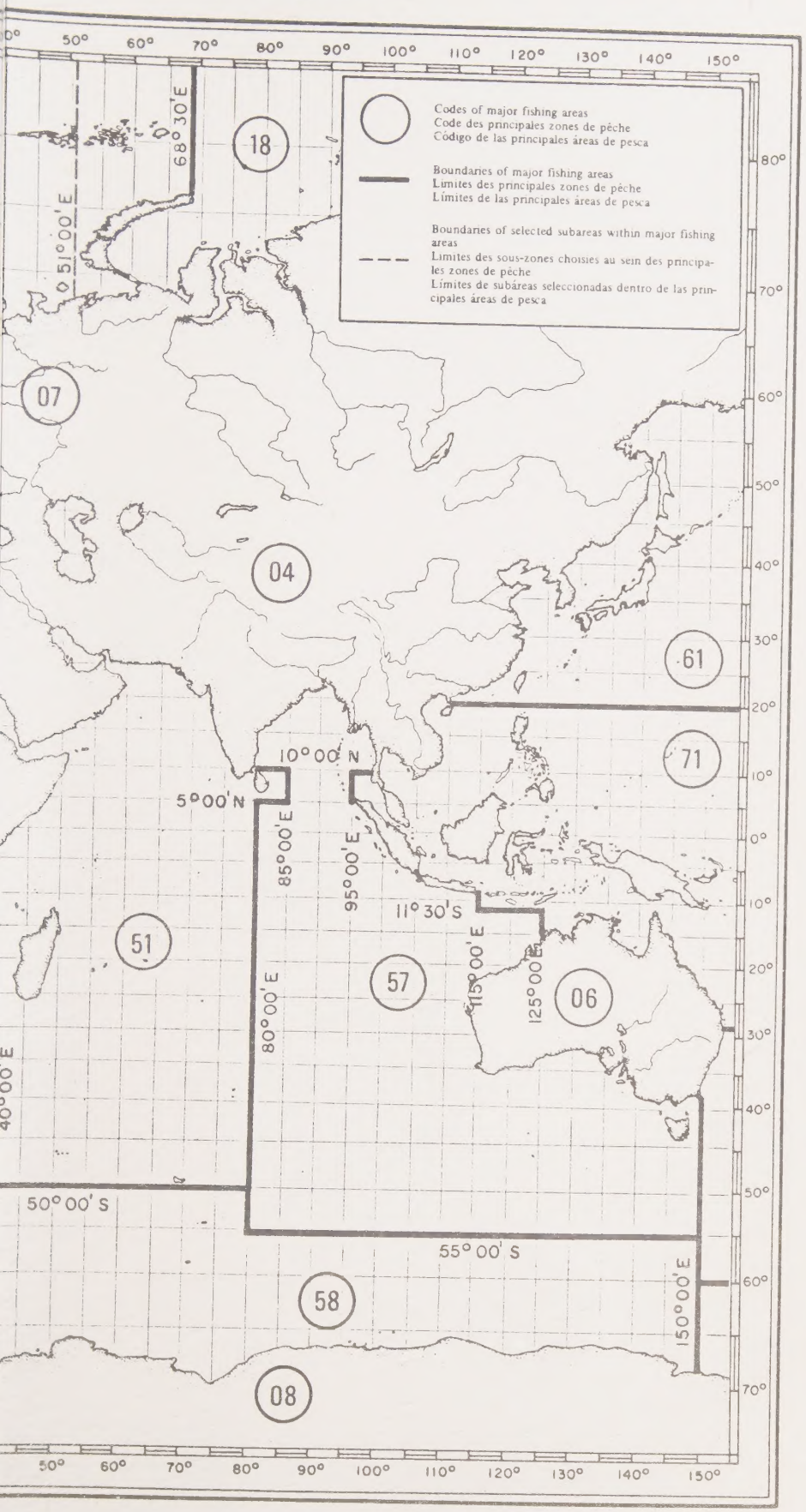
MAJOR FISHING AREAS FOR STATISTICAL PURPOSES



PRINCIPALES ZONES DE PÊCHE A FINS STATISTIQUES

AREAS PRINCIPALES PAR




Codes of major fishing areas
Code des principales zones de pêche
Código de las principales áreas de pesca
Boundaries of major fishing areas
Limites des principales zones de pêche
Límites de las principales áreas de pesca
Boundaries of selected subareas within major fishing areas
Limites des sous-zones choisies au sein des principales zones de pêche
Límites de subáreas seleccionadas dentro de las principales áreas de pesca
18
07
04
61
71
51
57
06
58
08
68°30'E
51°00'E
10°00'N
5°00'N
85°00'E
95°00'E
11°30'S
80°00'E
115°00'E
125°00'E
40°00'E
50°00'S
55°00'S
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